Degradation

1- Combatting global grassland degradation

By:
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Abstract

Grasslands provide key ecosystem services, but their protection is often ignored in sustainable policy. This Perspective describes grassland degradation and sets out the steps needed to protect these systems and promote their restoration.

Grasslands are under severe threat from ongoing degradation, undermining their capacity to support biodiversity, ecosystem services and human well-being. Yet, grasslands are largely ignored in sustainable development agendas. In this Perspective, we examine the current state of global grasslands and explore the extent and dominant drivers of their degradation. Socio-ecological solutions are needed to combat degradation and promote restoration. Important strategies include: increasing recognition of grasslands in global policy; developing standardized indicators of degradation; using scientific innovation for effective restoration at regional and landscape scales; and enhancing knowledge transfer and data sharing on restoration experiences. Stakeholder needs can be balanced through standardized assessment and shared understanding of the potential ecosystem service trade-offs in degraded and restored grasslands. The

integration of these actions into sustainability policy will aid in halting degradation and enhancing restoration success, and protect the socio-economic, cultural and ecological benefits that grasslands provide.

Keywords
Keywords Plus
ECOSYSTEM SERVICESPLANT DIVERSITYDESERT STEPPESTOCKING RATESOIL CARBONTRADE-OFFSSPECIES RICHNESSLAND DEGRADATIONRESTORATIONMANAGEMENT

Degradation

2- Photocatalytic degradation of rhodamine B using Bi4O5Br2-doped ZSM-5

By:
Zhang, MX (Zhang, Muxi) [1] , [2] ; Sun, XJ (Sun, Xiaojie) [1] , [2] ; Wang, CL (Wang, Chunlian) [1] , [2] ; Wang, YB (Wang, Yabo) [1] , [2] ; Tan, ZH (Tan, Zhihan) [1] , [2] ; Li, J (Li, Jie) [1] , [2] ; Xi, BD (Xi, Beidou) [1] , [2] , [3] , [4]

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Abstract

ZSM-5/Bi4O5Br2 composite catalyst based on the ZSM-5 zeolite and Bi4O5Br2 was prepared by in situ precipitation method at room temperature. The morphological, optical, structural, and photoelectrochemical properties of the composites were studied. The photocatalytic performance of the ZSM-5/Bi4O5Br2 photocatalyst was evaluated through degrading rhodamine B (RhB) dye under visible light irradiation. The photocatalytic result confirms that ZSM-5/Bi4O5Br2 photocatalyst with 1 wt% of ZSM-5 exhibits the best photocatalytic performance, and it achieves 99.86% removal efficiency in removing RhB within 25 min, and its reaction rate constant is 2.32 times that of pure Bi4O5Br2. The specific surface area of ZSM/Bi4O5Br2 is four times that of Bi4O5Br2, which provides more active sites for photocatalytic degradation. The improved photocatalytic activity of ZSM/Bi4O5Br2 composite is mainly attributed to the interaction between ZSM-5 and Bi4O5Br2, which increases the electron transfer of the interface. center dot O-2 and h(+) are the main active groups in the photocatalytic degradation reaction system. These studies reveal that the catalyst is easy to prepare and is an efficient photocatalyst for RhB degradation. This study supplies a reference for the degradation of RhB by ZSM-5 composite Bi4O5Br2 photocatalyst induced by visible light at room temperature.

Keywords
Author Keywords
ZSM-5 zeoliteBi4O5Br2Photocatalytic degradationActive group
Keywords Plus

Degradation

SOLVOTHERMAL SYNTHESISPHOTO DEGRADATIONMETHYLENE-BLUEPERFORMANCECOMPOSITESMECHANISMEFFICIENTDESIGNDYEZNO

Degradation

3- Facile construction of novel organic-inorganic tetra (4-carboxyphenyl) porphyrin/Bi2MoO6 heterojunction for tetracycline degradation: Performance, degradation pathways, intermediate toxicity analysis and mechanism insight

By:
Wang, CC (Wang, Chunchun) [1] ; Cai, MJ (Cai, Mingjie) [1] ; Liu, YP (Liu, Yanping) [1] ; Yang, F (Yang, Fang) [2] ; Zhang, HQ (Zhang, Huiqiu) [1] ; Liu, JS (Liu, Jianshe) [3] ; Li, SJ (Li, Shijie) [1]

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Abstract

Developing durable photocatalysts with highly efficient antibiotics degradation is crucial for environment purification. Herein, tetra (4-carboxyphenyl) porphyrin (TCPP) was loaded onto the surface of Bi2MoO6 microspheres to gain hierarchical organic-inorganic TCPP/Bi2MoO6 (TCPP/BMO) heterojunctions via a facile impregnation strategy. The catalytic properties of these catalysts were comprehensively investigated through the photodegradation of tetracycline hydrochloride (TC) under visible light. Among all the TCPP/BMO heterojunctions, the highest photodegradation rate constant (0.0278 min(-1)) was achieved with 0.25 wt% TCPP (TCPP/BMO-2), which was approximately 1.15 folds greater than that of pristine Bi2MoO6 and far superior to pure TCPP. The extremely high photocatalytic performance is attributed to the interfacial interaction between TCPP and Bi2MoO6, which favors the efficient separation of charge carriers and the enhancement of visible-light absorbance. TCPP/BMO-2 possesses high mineralization capability and good recycling performance. Photo-induced center dot O-2(-), h(+), and

center dot OH were mainly responsible for the degradation of TC. The degradation pathways of TC and toxicity of degradation intermediates were analyzed based on the intermediates detected by the high performance liquid chromatography mass spectrometer (HPLC-MS) and the toxicity assessment by the quantitative structure-activity relationship (QSAR) prediction. A possible photocatalytic mechanism over TCPP/BMO is proposed. This work offers an insight in developing the porphyrin-based organic-inorganic heterojunctions for effectively remedying pharmaceutical wastewater. (C) 2021 Elsevier Inc. All rights reserved.

Keywords
Author Keywords
TCPP/Bi2MoO6Visible-light photocatalysisTetracycline degradationDegradation pathwayToxicity assessment

Keywords Plus
EN

Degradation

4- Photocatalytic degradation of antibiotics using a novel Ag/Ag2S/Bi2MoO6 plasmonic p-n heterojunction photocatalyst: Mineralization activity, degradation pathways and boosted charge separation mechanism

By:
Li, SJ (Li, Shijie) [1] ; Wang, CC (Wang, Chunchun) [1] , [2] ; Liu, YP (Liu, Yanping) [1] , [2] ; Xue, B (Xue, Bing) [1] , [2] ; Jiang, W (Jiang, Wei) [1] ; Liu, Y (Liu, Yu) [1] ; Mo, LY (Mo, Liuye) [1] ; Chen, XB (Chen, Xiaobo) [3]
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Abstract

A novel Ag/Ag2S/Bi(2)MoO(6)plasmonic p-n heterojunction has been constructed via the in-situ growth of p-type Ag2S nanoparticles on n-type Bi2MoO6 microspheres, followed by the photo-reduction treatment. Simultaneously, the Ag-0 loading percentage in the heterojunction could be finely controlled by tuning the photo-reduction time. The optimized Ag/Ag2S/Bi2MoO6 (AAS/BMO-4) manifests the highest photocatalytic performance towards degrading levofloxacin (LEV) and tetracycline hydrochloride (TC), which degradation efficiencies are 87.3% and 92.8%, respectively. Such improvement mechanism could be due to the improved light absorption in the visible-light region induced by localized surface plasmon resonance (LSPR) and the efficient interfacial separation and transport of charge carriers in Ag/Ag2S/Bi2MoO6. The impacts of some key parameters (e.g., various inorganic anions, representative organic substances and various water resources) are systematically investigated. Ag/Ag2S/Bi2MoO6 also

exhibits excellent mineralization capability and recycling performance in degrading LEV. Moreover, photo-generated h(+), (OH)-O-center dot, and O-center dot(2)- are identified as the dominant reactive species accounting for the degradation of antibiotics. The photodegradation pathway of LEV has also been elucidated based on the intermediate identification. Therefore, this study not only reports an innovative plasmonic p-n heterojunction but also the new design of photocatalysts capable of efficiently degrading pharmaceutical antibiotics under visible-light irradiation.

Keywords

Author Keywords
Plasmonic p-n heterojunctionAg/Ag2S/Bi2MoO6Visible-light photocatalysisAntibiotic degradationDegradation pathway
Keywords Plus
FACILE FABRICATIONEXCHANGE SYNTHESISBISMUTH MOLYBDATEEFFICIENTNANOPARTICLESNANOSHEETSBI2MOO6AGOXIDATIONREMOVAL

Degradation

5- Shallow Iodine Defects Accelerate the Degradation of alpha-Phase Formamidinium Perovskite

By:
Tan, S (Tan, Shaun) [1] , [2] ; Yavuz, I (Yavuz, Ilhan) [3] ; Weber, MH (Weber, Marc H.) [4] ; Huang, TY (Huang, Tianyi) [1] , [2] ; Chen, CH (Chen, Chung-Hao) [1] , [2] , [5] ; Wang, R (Wang, Rui) [1] , [2] ; Wang, HC (Wang, Hao-Cheng) [1] , [2] , [5] ; Ko, JH (Ko, Jeong Hoon) [6] ; Nuryyeva, S (Nuryyeva, Selbi) [1] , [2] ; Xue, JJ (Xue, Jingjing) [1] , [2] ; ...More
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Abstract

Shallow defects are mostly benign in covalent semiconductors, such as silicon, given that they do not constitute non-radiative recombination sites. In contrast, the existence of shallow defects in ionic perovskite crystals might have significant repercussions on the long-term stability of perovskite solar cells (PSCs) because of the metastability of the ubiquitous formamidinium lead triiodide (FAPbI(3)) perovskite and the migration of charged point defects. Here, we show that shallow iodine interstitial defects (I-i) can be generated unintentionally during commonly used post-fabrication treatments, which can lower the cubic-to-hexagonal transformation barrier of FAPbI(3)-based perovskites to accelerate its phase degradation. We demonstrate that concurrently avoiding the generation of I-i and the more effective passivation of iodine vacancies (V-I) can improve the thermodynamic stability of the films and operational stability of the PSCs. Our most stable PSC retained 92.1 % of its initial performance after nearly 1,000 h of continuous illumination operational stability testing.

Degradation

6- Photocatalytic degradation of organic pollutants using TiO2-based photocatalysts: A review

By:
Chen, DJ (Chen, Dongjie) [1] , [2] , [3] ; Cheng, YL (Cheng, Yanling) [1] , [2] ; Zhou, N (Zhou, Nan) [1] , [2] ; Chen, P (Chen, Paul) [1] , [2] ; Wang, YP (Wang, Yunpu) [1] , [2] , [4] ; Li, K (Li, Kun) [4] ; Huo, SH (Huo, Shuhao) [6] ; Cheng, PF (Cheng, Pengfei) [1] , [2] ; Peng, P (Peng, Peng) [1] , [2] ; Zhang, RC (Zhang, Renchuang) [1] , [2] ; ...More
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Abstract

Organic compounds, generated from different industries, produce a range of the problematic pollutants in wastewater. TiO2 based photocatalysts are novel materials that exhibit excellent absorption behavior toward organic compounds in wastewater due to their outstanding properties including nontoxicity, high photocatalytic degradation ability, and excellent thermal and chemical stabilities. However, several challenges exist regarding TiO2 applications for organic effluents such as particle aggregation, mass transfer limitation, poor affinity, high band energy, scattering conditions, and difficulty of recovery. Therefore, more design and optimization testing need to be conducted on the treatment conditions in order to reach higher removal efficiencies with lower costs. A variety of parameters of TiO2 based photocatalysts need to be studied: substrate, light intensity, dopant, particle size, structure. These parameters, which affect TiO2 photocatalytic activity on organic pollutants, are discussed in the current review. Thus, making the photocatalyst more anticipated and conducive to further research and development.

Keywords

Author Keywords

Degradation

Organic pollutantsTiO2 based photocatalystsPhotocatalytic degradationProcessing parameters

Keywords Plus

DOPED TITANIUM-DIOXIDEWASTE-WATER TREATMENTVISIBLE-LIGHTGRAPHENE OXIDEPHENOL DEGRADATIONMETHYLENE-BLUEPHOTO-FENTONHYDROTHERMAL SYNTHESISENHANCED DEGRADATIONAQUEOUS SUSPENSIONS

Degradation

7- Understanding plastic degradation and microplastic formation in the environment: A review

By:
Zhang, K (Zhang, Kai) [1] ; Hamidian, AH (Hamidian, Amir Hossein) [2] , [4] ; Tubic, A (Tubic, Aleksandra) [3] ; Zhang, Y (Zhang, Yu) [4] ; Fang, JKH (Fang, James K. H.) [5] , [6] ; Wu, CX (Wu, Chenxi) [1] ; Lam, PKS (Lam, Paul K. S.) [5]
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Abstract

Plastic waste are introduced into the environment inevitably and their exposure in the environment causes deterioration in mechanical and physicochemical properties and leads to the formation of plastic fragments, which are considered as microplastics when their size is < 5 mm. In recent years, microplastic pollution has been reported in all kinds of environments worldwide and is considered a potential threat to the health of ecosystems and humans. However, knowledge on the environmental degradation of plastics and the formation of microplastics is still limited. In this review, potential hotspots for the accumulation of plastic waste were identified, major mechanisms and characterization methods of plastic degradation were summarized, and studies on the environmental degradation of plastics were evaluated. Future research works should further identify the key environmental parameters and properties of plastics affecting the degradation in order to predict the fate of plastics in different environments and facilitate the development of technologies for reducing plastic pollution. Formation and degradation of microplastics, including nanoplastics, should receive more research attention to assess their fate and ecological risks in the environment more comprehensively.

Keywords

Degradation

Author Keywords
PlasticsHotspotsFateDegradation mechanismsCharacterization
Keywords Plus
3 GORGES RESERVOIRSURFACE-PROPERTIESFRESH-WATERPOLYESTER POLYURETHANEDENSITY POLYETHYLENEPOLYMERIC MATERIALSPOLYVINYL-CHLORIDEMARINE-ENVIRONMENTUV-IRRADIATIONPOLYSTYRENE

8- Role of tourism development in environmental degradation: A step towards emission reduction

By:
Liu, Z (Liu, Zhen) [1] ; Lan, J (Lan, Jing) [2] ; Chien, FS (Chien, Fengsheng) [3] , [4] ; Sadiq, M (Sadiq, Muhammad) [5] ; Nawaz, MA (Nawaz, Muhammad Atif) [6]
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Abstract

Globally, the interaction and vulnerability of tourism and climate change have recently been in focus. This study examines how carbon dioxide emissions respond to changes in the tourism development. Panel data from 2000 to 2017 for 70 countries are analyzed using spatial econometric method to investigate the spatial spillover effect of tourism development on environmental pollution. The direct, indirect, and overall impact of tourism on environmental pollution are estimated after the selection of the most appropriate GNS method. The findings reveal that tourism has a positive direct effect and a negative indirect effect; both are significant at the 1 % level. The negative indirect effect of tourism is greater than its direct positive effect, implying an overall significantly negative impact. Further, the outcome of financial development and carbon emissions have an inverted U-shaped and U-shaped relationship in direct and indirect impacts. Population density, trade openness and economic growth significantly influence on environmental pollution through spatial spill over. In addition, education expenditure and infrastructure play a significant moderating role in the relationship among tourism development and environmental pollution. The results have important policy implications as they establish an inverted-Ushaped relationship among tourism and environmental pollution and indicate that while a country's emissions initially rise with the tourism industry's growth, they begin declining after a limit.

Degradation

Keywords

Author Keywords
TourismFinancial developmentEconomic growthGNS modelEmission reduction
Keywords Plus
CO2 EMISSIONSRENEWABLE ENERGYECONOMIC-GROWTHCONSUMPTIONCOUNTRIESINCOMETRADETESTS

Degradation

9- Heterogeneous UV-Switchable Au nanoparticles decorated tungstophosphoric acid/TiO2 for efficient photocatalytic degradation process

By:
Orooji, Y (Orooji, Yasin) [1] , [2] ; Tanhaei, B (Tanhaei, Bahareh) [3] ; Ayati, A (Ayati, Ali) [3] ; Tabrizi, SH (Tabrizi, Soheil Hamidi) [3] ; Alizadeh, M (Alizadeh, Marzieh) [4] ; Bamoharram, FF (Bamoharram, Fatemeh F.) [5] ; Karimi, F (Karimi, Fatemeh) [3] ; Salmanpour, S (Salmanpour, Sadegh) [6] ; Rouhi, J (Rouhi, Jalal) [7] ; Afshar, S (Afshar, Safoora) [3] ; ...More
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Abstract

In the present study, gold nanoparticles were locally well-decorated on the surface of TiO2 using the tungstophosphoric acid (HPW), as UV-switchable reducing intermediate linkers. The prepared Au NPs/HPW/TiO2 nanostructure was characterized using FTIR, XRD, EDS, SEM and TEM, which confirmed the successful attachment of quasi-spherical Au NPs in the range of 20-30 nm on the surface of HPW modified TiO2. Also, the FTIR results show that the Au NPs were binded to TiO2 through the terminal the oxygen atoms HPW. The photocatalytic performance of prepared nanostructures was assessed in degradation of nitrobenzene. The nitrobenzene photodegradation kinetic study revealed that it well followed the Langmuir-Hinshelwood kinetic model with the apparent rate constant of 0.001 min(-1) using anatase TiO2, 0.0004 min(-1) using HPW, 0.0014 using HPW/TiO2, while it was obtained 0.0065 min(-1) using Au NPs@HPW/TiO2 nanostructure. It shows that the photocatalytic rate of the prepared nanocomposites increased by 6.5- and 4.6-fold compared to photoactivity of anatase TiO2 and HPW/TiO2 respectively. Also, the photocatalytic mechanism of process was proposed. Moreover, the reusability study confirmed that its photocatalytic activity still remained high after three cycles.

Degradation

Keywords

Author Keywords
TiO2PolyoxometalateGold nanoparticleNitrobenzenePhotodegradation

Keywords Plus
METAL NANOPARTICLESGOLD NANOPARTICLESDOPED TIO2REMOVALPOLYOXOMETALATENANOCOMPOSITENITROBENZENEWATERPERFORMANCEELECTRODE

Degradation

10- Bicarbonate-enhanced iron-based Prussian blue analogs catalyze the Fenton-like degradation of p-nitrophenol

By:
Yang, YQ (Yang, Yiqiong) [1] ; Gu, YX (Gu, Yixin) [1] ; Lin, HD (Lin, Huidong) [1] ; Jie, BR (Jie, Borui) [1] ; Zheng, ZH (Zheng, Zenghui) [1] ; Zhang, XD (Zhang, Xiaodong) [1]

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Abstract

P-nitrophenol (PNP), a widely used compound, is harmful to the environment and human health. In this study, four iron-based Prussian blue analogs (PBAs) were prepared by coprecipitation (Co-Fe PBA, Mn-Fe PBA, Cu-Fe PBA and Fe-Fe PBA). The Co-Fe PBA exhibited high peroxymonosulfate (PMS) activation performance for PNP degradation, removing over 90% of PNP in 60 min at an optimal pH of 7, temperature at 30 celcius, initial concentration of 20 mg/L, PBA dose of 0.2 g/L and PMS dose of 1 g/L. The physicochemical properties of the Co-Fe PBA were investigated by various characterization methods. The catalytic activity of PBA and the influence of various process parameters and water quality on the catalytic reaction were investigated to elucidate the mechanism of p-nitrophenol degradation by PBA-activated persulfate. Moreover, the mechanism of accelerated degradation of PNP under HCO3- conditions and the role of major reactive oxides were determined by EPR measurement methods and free radical trapping experiments. HCO3- was found to directly activate PMS to produce reactive oxygen species, and O-1(2), (OH)-O-center dot and SO4 center dot- were all greatly increased. This work presents a promising green heterogeneous catalyst for the degradation of emerging contaminants (ECs) in real wastewater with natural organic matter and coexisting anions by PMS activation.

Degradation

Keywords
Author Keywords
P-nitrophenolPeroxymonosulfatePrussian blue analogBicarbonate
Keywords Plus
PHOTOCATALYTIC DEGRADATIONAQUEOUS-SOLUTIONWATERPEROXYMONOSULFATETETRACYCLINEMECHANISMOXIDATIONFECUMONTMORILLONITE

Degradation

11- Asymmetric nexus between technological innovation and environmental degradation in Sweden: an aggregated and disaggregated analysis

By:
Adebayo, TS (Adebayo, Tomiwa Sunday) [1] ; Oladipupo, SD (Oladipupo, Seun Damola) [2] ; Kirikkaleli, D (Kirikkaleli, Dervis) [3] ; Adeshola, I (Adeshola, Ibrahim) [4]
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Abstract

The number of studies on the relationship between technological innovation and CO2 emissions has gradually increased in recent years, although there is no clear agreement in the literature. Previous research has revealed both positive and negative consequences of technological innovation on the environment. Moreover, most researchers have used linear approaches to explore this connection, which can result in spurious outcomes when nonlinearities exist in the data. According to this background, this research utilizes asymmetric ARDL and spectral causality approaches to assess the asymmetric connection between technological innovation and CO2 emissions in Sweden utilizing data from 1980 to 2018. In addition, the disaggregated asymmetric effects of technological innovation (patent resident and patent nonresident) on CO2 are also captured in this study. The Nonlinear Autoregressive Distributed lag (NARDL) results showed that positive (negative) shocks in economic growth enhance environmental quality in Sweden. Furthermore, a positive (negative) shock in technological innovation causes a decrease (increase) in CO2. Similarly, a positive (negative) shock in patent nonresident and residents leads to a decrease (increase) in CO2 emissions in Sweden. The outcomes from the spectral causality revealed that in the

medium and long term, aggregate and disaggregate technological innovation can predict CO2 emissions in Sweden. This study has significant policy implications for policymakers and the government in Sweden. Based on these findings, the study suggests that the government of Sweden should investment in technological innovation since it plays a vital role in curbing environmental degradation.

Keywords
Author Keywords
CO2 emissionsEconomic growthGlobalizationTechnological innovationSweden
Keywords Plus
CO2 EMISSIONSECONOMIC-GROWTHENERGY-CONSUMPTIONFINANCIAL DEVELOPMENTCARBON EMISSIONSFOREIGN-TRADEGLOBALIZATIONPERFORMANCEHYPOTHESISQUALITY

Degradation

12- Gold nanoparticles-modified MnFe2O4 with synergistic catalysis for photo-Fenton degradation of tetracycline under neutral pH

By:
Qin, L (Qin, Lei) [1] , [2] ; Wang, ZH (Wang, Zhihong) [1] , [2] ; Fu, YK (Fu, Yukui) [1] , [2] ; Lai, C (Lai, Cui) [1] , [2] ; Liu, XG (Liu, Xigui) [1] , [2] ; Li, BS (Li, Bisheng) [1] , [2] ; Liu, SY (Liu, Shiyu) [1] , [2] ; Yi, H (Yi, Huan) [1] , [2] ; Li, L (Li, Ling) [1] , [2] ; Zhang, MM (Zhang, Mingming) [1] , [2] ; ...More

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Abstract

To decrease the adverse environmental and health-related effects of antibiotics, a series of MnFe2O4-Au (MFO-Au) composites were prepared by simple co-precipitation and photoreduction methods for efficient photo-Fenton degradation of tetracycline (TC). The synergistic effect of MFO and gold nanoparticles (AuNPs) with high absorption of visible light and strong photogenerated carrier separation efficiency endowed MFO-Au-3 an outstanding photo-Fenton catalytic performance for TC degradation in neutral condition. The surface hydroxyl of MFO profited to generation of center dot OH, and negative charged or partially polarized AuNPs benefited to adsorption of H2O2, which had a synergistic effect on enhancing the photo-Fenton catalytic performance of MFO-Au. 88.3% of TC was efficiently removed and about 51.9% of TOC decreased within 90 min. The electron spin resonance and quenching tests suggested that h(+) and e(-) were responsible for the high catalytic degradation and center dot OH and O-2(-) participated in the photo-Fenton reaction. The toxicity assessment by seed germination experiments showed efficient toxicity reduction of this system. Besides, MFO-Au exhibited high stability, good cycle, relatively economical and practical application performance, which is expected to provide potential guidance for the design and combination of noble nanoparticles with high stability and spinel bimetallic oxides with high catalytic activity in photo-Fenton reactions.

Keywords

Degradation

Author Keywords

Antibiotics degradationPhoto-FentonMnFe2O4AuNPsToxicity assessment

Keywords Plus

PHOTOCATALYTIC ACTIVITYDIAMOND NANOPARTICLESFACILE SYNTHESISREMOVALMECHANISMANTIBIOTICSPERFORMANCEFABRICATIONACTIVATIONOXIDATION

Degradation

13- Online extremum seeking-based optimized energy management strategy for hybrid electric tram considering fuel cell degradation

By:
Li, Q (Li, Qi) [1] ; Wang, TH (Wang, Tianhong) [1] , [2] ; Li, SH (Li, Shihan) [1] ; Chen, WR (Chen, Weirong) [1] ; Liu, H (Liu, Hong) [3] , [4] ; Breaz, E (Breaz, Elena) [2] , [5] ; Gao, F (Gao, Fei) [2]

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Abstract

In order to realize optimal power distribution between proton exchange membrane fuel cell and supercapacitor in hybrid electric tram, an online extremum seeking-based optimized energy management strategy is proposed in this work. Considering that the fuel cell is a complex nonlinear system, its performance will vary as the external parameters change, so it is necessary to consider the performance state of stack. An online extremum seeking algorithm is investigated in this work to seek the maximum power and maximum efficiency points by searching the variation in fuel cell performance. Besides, this work also updates its "safe operating zone" based on the results of the online extremum seeking. This process is achieved by the adaptive recursive least square algorithm. Furthermore, in order to limit the power dynamic of fuel cell, the degradation of the stack is considered in this study. To guarantee the stable and continued operation of the electric tram, the state of charge fluctuation range of supercapacitor is also limited. The effectiveness of the presented method is successfully verified under scaleddown operating condition of hybrid electric tram on the reduced-scale test platform. The proposed method is also compared with state machine control and equivalent consumption minimization strategy to further demonstrate that it has advantages in hydrogen consumption, state of charge fluctuation, efficiency, and fuel cell output power dynamics.

Degradation

Keywords
Author Keywords
Proton exchange membrane fuel cellSupercapacitorSystem efficiencyHydrogen consumption

Degradation

14- Does globalization matter for environmental degradation? Nexus among energy consumption, economic growth, and carbon dioxide emission

By:
Jun, W (Jun, Wen) [1] ; Mughal, N (Mughal, Nafeesa) [1] ; Zhao, J (Zhao, Jin) [2] ; Shabbir, MS (Shabbir, Malik Shahzad) [3] ; Niedbala, G (Niedbala, Gniewko) [4] ; Jain, V (Jain, Vipin) [5] ; Anwar, A (Anwar, Ahsan) [6] , [7]
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Abstract

This study scrutinizes the impact of globalization, non-renewable energy consumption, and economic growth on CO2 emission for selected South Asian economies during 1985-2018 under the EKC framework. For this purpose, we apply a fully modified ordinary least square (FMOLS) technique. The empirical findings of this study identify that globalization is positively associated with CO2 emission. The results also indicate that non-renewable energy consumption increasing environmental pollution. Moreover, the results confirm the EKC hypothesis in the South Asian region; this means that at the early stages of development, when economic growth increases, environmental pollution also increases, but environmental degradation starts to decrease with the increases in economic growth after the threshold point. The empirical outcomes suggest that the government should subsidize and promote renewable energy sources to tackle the problem of environmental degradation.

Keywords

Author Keywords

Degradation

GlobalizationNon-renewable energy consumptionCO2 emissionSouth Asian countries

Keywords Plus

KUZNETS CURVE HYPOTHESISCO2 EMISSIONSRENEWABLE ENERGYELECTRICITY CONSUMPTIONFINANCIAL DEVELOPMENTNONRENEWABLE ENERGYIMPACTINCOMEPANELCOINTEGRATION

Degradation

15- Effect of inorganic anions on the performance of advanced oxidation processes for degradation of organic contaminants

By:
Wang, JL (Wang, Jianlong) [1] , [2] ; Wang, SZ (Wang, Shizong) [1] , [2]
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Abstract

Inorganic anions, such as chloridion, carbonate, phosphate, sulfate and nitrate are ubiquitous in water, they will react with hydroxyl radical and sulfate radical produced during advanced oxidation processes (AOPs), to form chlorine radical, carbonate radical nitrate radical, phosphate radical and sulfate radical, which have a significant influence on the transformation of organic pollutants. It is generally believed that the quenching effect of inorganic anions on reactive species produced in AOPs was the main reason to influence the performance of AOPs. While this reason cannot explain all the results. In addition, at present most of studies only focused on the effect of inorganic anions on the removal efficiency of targeted organic pollutant by AOPs. For better understanding the effect of inorganic anions on the performance of AOPs, it is crucial to comprehensively evaluate the effect of inorganic anions on AOPs. In this review paper, the effect of inorganic anions (such as chloridion, carbonate, phosphate, sulfate and nitrate) on the performance of AOPs, including the transformation of reactive species, stability of oxidants, catalytic activity of catalysts and degradation products, was systematically summarized and reviewed. Firstly, their effect on the formation and transformation of reactive species was discussed, then the effect on the stability of oxidants (H2O2 and persulfate) and catalysts was introduced. Furthermore, the effect on the

catalytic activity of catalysts was analyzed. Finally, the effect on the degradation intermediate products of organic pollutants was summarized. This review will provide an insight into the underlying influence mechanism of inorganic anions on AOPs, which is conducive to comprehensively evaluate the effect of inorganic anions on the performance of AOPs.

Keywords
Author Keywords
Advanced oxidation processesInorganic anionsReactive speciesCatalytic activityDegradation products
Keywords Plus
ACTIVATED PERSULFATE OXIDATIONRADICAL-INDUCED DEGRADATIONACID ORANGE 7HYDROGEN-PEROXIDERATE CONSTANTSSURFACE COMPLEXATIONPHOSPHATE RADICALSHYDROXYL RADICALSAQUEOUS-SOLUTIONSPHENOLIC-COMPOUNDS

Degradation

16- Core-shell magnetic Fe3O4@Zn/Co-ZIFs to activate peroxymonosulfate for highly efficient degradation of carbamazepine

By:
Wu, ZL (Wu, Zelin) [1] , [2] ; Wang, YP (Wang, Yupeng) [1] , [2] ; Xiong, ZK (Xiong, Zhaokun) [1] , [2] ; Ao, ZM (Ao, Zhimin) [3] ; Pu, SY (Pu, Shengyan) [4] ; Yao, G (Yao, Gang) [2] , [5] ; Lai, B (Lai, Bo) [1] , [2]
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Abstract

A core-shell metal-organic framework encapsulated Fe3O4 magnetic particles (Fe3O4@Zn/Co-ZIFs) was designed and synthesized successfully to activate peroxymonosulfate (PMS) for carbamazepine (CBZ) degradation. It exhibits superior catalytic performance since the unique interior structure and synergistic effect between ZIFs shell and Fe3O4 core, achieving 100% removal of CBZ (5 mg/L) within 30 min. The outer wrapping structure of ZIF-8 can stabilize the ZIF-67 and Fe3O4 under intricate reaction conditions to restrain the leaching of Co ions (as low as 0.067 mg/L). Further investigation found that both SO4 center dot- and OH center dot contribute to the degradation of CBZ at initial stage, and SO4 center dot- gradually plays a pivotal role with the reaction time prolonging. The acceleration of electron transfer between Fe3O4 and cobalt active sites of Zn/Co-ZIFs could induce the redox cycling of Co2+ and Co3+. The possible degradation pathway was proposed by analyzing intermediates. This work extends the development of MOFs materials for environmental remediation.

Keywords

Author Keywords
PeroxymonosulfateMetal-organic frameworksCarbamazepineReaction mechanismDegradation pathway
Keywords Plus

Degradation

METAL-ORGANIC FRAMEWORKSNITROGEN-DOPED CARBONSULFAMETHOXAZOLE REMOVAL PERFORMANCEZERO-VALENT IRONBISPHENOL-ACATALYTIC DEGRADATIONCONTAMINANT DEGRADATIONADVANCED OXIDATIONFENTON-LIKEPERSULFATE

Degradation

17- A novel step-scheme BiVO4/Ag3VO4 photocatalyst for enhanced photocatalytic degradation activity under visible light irradiation

By:
Liu, LZ (Liu, Lizhong) [1] ; Hu, TP (Hu, Taiping) [1] ; Dai, K (Dai, Kai) [1] ; Zhang, JF (Zhang, Jinfeng) [1] ; Liang, CH (Liang, Changhao) [2] , [3]
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Abstract

Over the past few years, the emission of organic pollutants into the environment has increased tremendously. Therefore, various photocatalysts have been developed for the degradation of organic pollutants. In this study, a step-scheme BiVO4/Ag3VO4 composite was synthesized via a hydrothermal and chemical deposition process for the degradation of methylene blue. The composite showed strong

redox ability under visible light. The 40%BiVO4/Ag3VO4 composite showed excellent photocatalytic degradation properties with a K-app of 0.05588 min(-1), which is 22.76 and 1.76 times higher than those of BiVO4 (0.00247 min(-1)) and Ag3VO4 (0.03167 min(-1)), respectively. The composite showed a stable performance and could retain 90% of its photocatalytic activity even after four cycles. The improved catalytic performance of the composite as compared to BiVO4 and Ag3VO4 can be attributed to its novel step-scheme mechanism, which facilitated the separation of the photogenerated charges and increased their lifetime. The photoluminescence measurement results and transient photocurrent response revealed that the composite showed efficient extraction of charge carriers.

Keywords

Author Keywords

Step-scheme photocatalystBiVO4Ag3VO4Photocatalytic activityMethylene blue

Keywords Plus

CARBON NITRIDEHETEROJUNCTION PHOTOCATALYSTSFACILE SYNTHESISGRAPHENE OXIDEFABRICATIONEFFICIENTPERFORMANCECOMPOSITEWATERTIO2

Degradation

18- Facile construction of novel Bi2WO6/Ta3N5 Z-scheme heterojunction nanofibers for efficient degradation of harmful pharmaceutical pollutants

By:
Li, SJ (Li, Shijie) [1] ; Chen, JL (Chen, Jialin) [1] ; Hu, SW (Hu, Shiwei) [1] ; Wang, HL (Wang, Huanli) [2] , [3] ; Jiang, W (Jiang, Wei) [1] ; Chen, XB (Chen, Xiaobo) [3]
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Abstract

Pharmaceutical wastewater has become a severe, tremendous threaten to ecological environment and human health. Semiconductor photocatalysts have emerged as potential candidates for degrading pharmaceutical pollutants. Construction of highly efficient, stable and recyclable Z-scheme photocatalysts that are superior to individual constituents or widely studied heterojunction photocatalysts is very fascinating yet challenging. Herein, we report an efficient, stable and recyclable visible-light-driven (VLD) Bi2WO6/Ta3N5 Z-scheme heterojunction with compact interface contact fabricated via an electrospinning-calcination-solvothermal route, in which abundant Bi2WO6 nanosheets are in-situ, compactly and vertically grown on the surface of the Ta3N5 nanofibers. These as-fabricated Z-scheme Bi2WO6/Ta3N5 heterojunctions display dramatically enhanced VLD catalytic activity compared to pristine Bi2WO6, Ta3N5, or the mixture of Bi2WO6 and Ta3N5. Particularly, Bi2WO6/Ta3N5 (1.0Bi-Ta) presents the highest photocatalytic property for the removal of tetracycline hydrochloride (TC) and ciprofloxacin (CIP), achieving approximately 86.7% and 81.1% degradation efficiency, respectively. The extraordinary photocatalytic property is ascribed to the Z-scheme hetero-structure with unique core-shell architecture that realizes compactly interfacial contact between the components for efficient separation of photoexcited carriers, strong visible-light absorption, as well as possesses the strong oxidation ability of photo-excited hole, and the high reduction capacity of photo-excited electron. The trapping experiments combined with electron spin resonance (ESR) analyses verify the prevailing role of photo-induced holes (h(+)), superoxide radicals (center dot O2-), and hydroxyl radicals (center dot OH) in the Bi2WO6/Ta3N5

photocatalytic system. Notably, the direct contact between Bi2WO6/Ta3N5 and contaminants is experimentally demonstrated to be significant for the efficient degradation of pollutants. Moreover, Bi2WO6/Ta3N5 is endowed with easily recyclable characteristics and excellent durability. Therefore, this research illustrates that Bi2WO6/Ta3N5 may hold a great prospect for the treatment of harmful pharmaceutical pollutants.

Keywords
Author Keywords
Bi2WO6/Ta3N5Z-scheme heterojunctionElectrospinningVisible-light photocatalystsPharmaceutical pollutant treatmentClosely interfacial contact
Keywords Plus
ENHANCED PHOTOCATALYTIC PERFORMANCETIO2 NANOTUBE ARRAYSP-N HETEROJUNCTIONSTETRACYCLINE DEGRADATIONCHARGE SEPARATIONBISMUTH MOLYBDATETA3N5 PHOTOANODESRATIONAL DESIGNELECTRIC-FIELDQUANTUM DOTS

Degradation

19- Evolution of defects during the degradation of metal halide perovskite solar cells under reverse bias and illumination

By:
Ni, ZY (Ni, Zhenyi) [1] ; Jiao, HY (Jiao, Haoyang) [1] ; Fei, CB (Fei, Chengbin) [1] ; Gu, HY (Gu, Hangyu) [1] ; Xu, S (Xu, Shuang) [1] ; Yu, ZH (Yu, Zhenhua) [1] ; Yang, G (Yang, Guang) [1] ; Deng, YA (Deng, Yehao) [1] ; Jiang, Q (Jiang, Qi) [1] ; Liu, Y (Liu, Ye) [1] ; ...More
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Abstract

The efficiency and stability of perovskite solar cells are essentially determined by defects in the perovskite layer, yet their chemical nature and linking with the degradation mechanism of devices remain unclear. Here we uncover where degradation occurs and the underlying mechanisms and defects involved in the performance degradation of p-i-n perovskite solar cells under illumination or reverse bias. Light-induced degradation starts with the generation of iodide interstitials at the interfacial region between the perovskite and both charge transport layers. While we observe trap annihilation of two types of iodide defect at the anode side, we find negatively charged iodide interstitials near the cathode side, which we show to be more detrimental to the solar cell efficiency. The reverse-bias degradation is initialized by the interaction between iodide interstitials and injected holes at the interface between the electron transport layer and the perovskite. Introducing a hole-blocking layer between the layers suppresses this interaction, improving the reverse-bias stability.
The efficiency of perovskite solar cells decreases over time, yet the underlying mechanisms are unclear. Ni et al. observe charged iodide interstitial defects within the device layers and how they contribute to the efficiency degradation when the cell is operated under illumination or reverse bias.

Degradation

Keywords
Keywords Plus
DISTRIBUTIONSEFFICIENCYSTABILITYIODINE

Degradation

20- Green synthesis of Cu-doped ZnO nanoparticles and its application for the photocatalytic degradation of hazardous organic pollutants

By:
Karthik, KV (Karthik, K., V) [1] ; Raghu, AV (Raghu, A., V) [2] ; Reddy, KR (Reddy, Kakarla Raghava) [3] ; Ravishankar, R (Ravishankar, R.) [1] ; Sangeeta, M (Sangeeta, M.) [1] ; Shetti, NP (Shetti, Nagaraj P.) [4] ; Reddy, CV (Reddy, Ch Venkata) [5]
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Abstract

In recent times, the synthesis of metal nanoparticles (NPs) using plant extracts has recently emerged as an intriguing issue in the field of nanoscience and nanobiotechnology, with numerous advantages over conventional physicochemical approaches. In the current study, ZnO NPs were synthesized from Synadium grantii leaf extricate with varying Cu-dopant concentrations. In order to the synthesis of the pure and Cu-doped ZnO NPs, zinc nitrate hexahydrate and copper nitrate trihydrate were used as a precursor in leaf extracts of the plant. XRD, TEM, FTIR, XPS, and PL measurements were carried out to examine the physical and optical properties of the synthesized samples. The photocatalytic studies of the prepared samples were studied using Methylene blue (MB), Indigo Carmine (IC), and Rhodamine B (RhB) organic pollutants. The wurtzite crystal structure of synthesized samples was confirmed by XRD and TEM analysis. Further, the presence of functional groups in the prepared samples was confirmed by FTIR analysis. XPS analysis confirmed that the binding energies of a host material and dopant ions. The emission

peaks identified at 424, 446 and 573 nm are associated with the electron movement from the deep donor level, zinc interstitial to the zinc vacancy and oxygen vacancy. 3% and 5% Cudoped samples exhibited superior photocatalytic activity for MB, IC, and RhB dyes. The green synthesized ZnO NPs showed enriched photocatalytic performance, signifying that bio-synthesis can be an outstanding approach to develop versatile and environmental products.

Keywords
Author Keywords
Green synthesisDoped ZnO nanoparticlesMorphologyPhotocatalysisToxic organic pollutantsEnvironmental remediation
Keywords Plus
EMISSIONBEHAVIORDYE

Degradation

21- Impact of renewable energy consumption, globalization, and technological innovation on environmental degradation in Japan: application of wavelet tools

By:
Adebayo, TS (Adebayo, Tomiwa Sunday) [1] ; Kirikkaleli, D (Kirikkaleli, Dervis) [2]
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Abstract

With regard to environmental degradation in Japan, the world's third-largest economy, limited studies have been performed to illustrate the ecological aspects of the country's core and recent economic policies such as globalization, technological innovation, and renewable energy usage policies. Given this motivation, this research reveals a new perspective on the connection between CO2 emissions and GDP growth, renewable energy, technological innovation and globalization in Japan by employing wavelet statistical tools. The paper employs series of wavelet tools for datasets covering the period from 1990Q1 to 2015Q4. The empirical outcomes demonstrate proof of the interaction between renewable energy use, economic growth, technological innovation, globalization and CO2 emissions in both time and frequency. The empirical results of the wavelet analyses reveal that globalization, GDP growth, and technological innovation increase CO2 emissions in Japan, while renewable energy usage mitigates CO2 in the short and medium terms. The results demonstrate the significance of implementing policies effectively coordinated by the policymakers to curb the significant environmental degradation in Japan. Moreover, Japan should actively support renewable energy development and create a more competitive climate for investment in the renewable energy market.

Degradation

Keywords
Author Keywords
Renewable energy consumptionCO2 emissionsEconomic growthTechnological innovationGlobalizationJapan

Keywords Plus
ECONOMIC-GROWTHCO2 EMISSIONSFINANCIAL DEVELOPMENTEMPIRICAL-EVIDENCECARBON EMISSIONSDETERMINANTSCOHERENCEURBANIZATIONELECTRICITYNEXUS

Degradation

22- **Photocatalytic degradation of tetracycline antibiotics using three-dimensional network structure perylene diimide supramolecular organic photocatalyst under visible-light irradiation**

By:
Zhang, QC (Zhang, Qingchun) [1] ; Jiang, L (Jiang, Lei) [1] ; Wang, J (Wang, Jun) [1] ; Zhu, YF (Zhu, Yongfa) [2] ; Pu, YJ (Pu, Yujuan) [1] ; Dai, WD (Dai, Weidong) [1]
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Abstract

The occurrence of antibiotics in the ambient environment has raised serious concerns. In this work, the kinetics and mechanism of photocatalytic degradation tetracycline (TC) was investigated using three-dimensional network structure perylene diimide supramolecular organic photocatalyst (3D-PDI). Under visible-light irradiation, 3D-PDI exhibited excellent degradation performance and stability for several tetracycline-based antibiotics (e.g., tetracycline; chlortetracycline; oxytetracycline.). The adsorption and degradation rate of TC by 3D-PDI were 8.21 and 12.7 times higher than that of bulk-PDI. The enhanced adsorption and degradation performance of TC by 3D-PDI were mainly due to the larger specific surface area and Tr-electron conjugation of 3D network supramolecular system. Superoxide radical (O-center dot(2)-), hydrogen peroxide (H2O2) and hole (h(+)) the main reactive species (RSs) for TC degradation. Under the attack of photocatalytic RSs, TC undergoes hydroxylation, demethylation, aromatization, and ring-opening processes, and finally complete mineralization into CO2 and H2O. These results revealed that perylene diimide supramolecular photocatalyst may be efficiently applied for the remediation of tetracycline contaminated natural waters.

Keywords

Author Keywords

Degradation

Perylene diimideSupramolecularThree-dimensional network structurePhotocatalyticTetracycline antibiotics

Keywords Plus

DRIVEN WATER OXIDATIONHIGHLY EFFICIENTH-2 EVOLUTIONCARBONGRAPHENEREMOVALG-C3N4ENHANCEMENTCOMPOSITESADSORPTION

Degradation

23- Construction of hierarchical ZnIn2S4@PCN-224 heterojunction for boosting photocatalytic performance in hydrogen production and degradation of tetracycline hydrochloride

By:
Jin, PX (Jin, Pengxia) [1] ; Wang, L (Wang, Lei) [1] ; Ma, XL (Ma, Xiaolei) [1] ; Lian, R (Lian, Rui) [1] ; Huang, JW (Huang, Jingwei) [1] ; She, HD (She, Houde) [1] ; Zhang, MY (Zhang, Mingyi) [2] , [4] ; Wang, QZ (Wang, Qizhao) [1] , [2] , [3]

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Abstract

As a typical member of sulfide family, ZnIn2S4 bears impressive activity in photocatalysis. Nonetheless, egregious recombination of photo-excited electron and hole pairs confines its practical usage. In this study, PCN-224, a metal organic framework (MOF) composed of porphyrin linkers and Zr clusters, is employed to establish a novel hierarchical structured ZnIn2S4@PCN-224 via a solvothermal method. These as-prepared composites are further evaluated by visible-light-driven photocatalysis and able to present steady performance. The optimized ZnIn2S4@PCN-224 has a hydrogen production rate of 0.284 mmol h-1 in absence of Pt, higher than many contrastive ZnIn2S4-based photocatalysts even in assistance of Pt cocatalyst. Besides, it is able to dominate the degradation of tetracycline hydrochloride (TCH), giving 99.9 % pollutant removal within 60 min, about 4.7 times higher than that catalyzed by ZnIn2S4. It is supposed that the great improvement in photocatalysis is ascribable to the establishment of Z-scheme junction between ZnIn2S4 and PCN-224.

Keywords
Author Keywords
Metal organic frameworkPhotocatalystsHydrogen productionDegradationZnIn2S4
Keywords Plus

Degradation

METAL-ORGANIC FRAMEWORKSFUNCTIONALIZED ZIRCONIUM MOFLIGHT-DRIVEN PHOTOCATALYSTREDUCED GRAPHENE OXIDECR(VI) REDUCTIONCARBON NITRIDEH-2 EVOLUTIONEFFICIENTWATERCO2

Degradation

24- Photocatalytic degradation of tetracycline antibiotic by a novel Bi2Sn2O7/Bi2MoO6 S-scheme heterojunction: Performance, mechanism insight and toxicity assessment

By:
Li, SJ (Li, Shijie) [1] , [2] ; Wang, CC (Wang, Chunchun) [1] , [2] ; Liu, YP (Liu, Yanping) [1] , [2] ; Cai, MJ (Cai, Mingjie) [1] , [2] ; Wang, YN (Wang, Yaning) [1] ; Zhang, HQ (Zhang, Huiqiu) [1] ; Guo, Y (Guo, Yang) [3] ; Zhao, W (Zhao, Wei) [4] ; Wang, ZH (Wang, Zhaohui) [5] , [6] , [7] ; Chen, XB (Chen, Xiaobo) [8]
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Abstract

The fabrication of step-scheme (S-scheme) heterojunction with superior redox capability has been emerging as a prospective strategy for environmental remediation. Herein, novel Bi2Sn2O7/Bi2MoO6 S-scheme heterojunctions have been fabricated via in-situ anchoring Bi2Sn2O7 nanoparticles on Bi2MoO6 microspheres. The optimized Bi2Sn2O7/Bi2MoO6 (BSO/BMO-6%) attains the highest reaction rate constant (k) in the degradation of tetra-cycline hydrochloride (TC, k = 0.0397 min(-1)), which is 3.62 folds higher than that of pristine Bi2MoO6. Such an improvement is originated from more exposed active sites, higher photo-excited charge separation efficiency, superior redox ability, and efficient production of reactive h(+), center dot OH and center dot O2-. Besides, Bi2Sn2O7/Bi2MoO6 could efficiently degrade the TC antibiotic in actual water matrix. Significantly, the toxicity evaluation verifies the nontoxicity of Bi2Sn2O7/Bi2MoO6. Moreover, the degradation pathways of TC are determined and the toxicity of degradation intermediates is appraised by using HPLC-MS spectra and QSAR prediction. A possible photocatalytic mechanism over S-scheme Bi2Sn2O7/Bi2MoO6 has been elucidated based on experimental studies combined with density functional theory (DFT) calculations. This work offers new insights for the design of highperformance S-scheme heterojunctions for environmental remediation.

Keywords

Degradation

Author Keywords
S-scheme heterojunctionBi2Sn2O7/Bi2MoO6Visible-light photocatalysisAntibiotic degradationToxicity assessment
Keywords Plus
CHARGE SEPARATIONRESISTANCE GENESFACILE SYNTHESISEFFICIENTCONSTRUCTIONWATERHETEROSTRUCTUREFABRICATIONMICROSPHERESMOLYBDATE

Degradation

25- One-pot hydrothermal fabrication of BiVO4/Fe3O4/rGO composite photocatalyst for the simulated solar light-driven degradation of Rhodamine B

By:
Zhao, SY (Zhao, Shuangyang) [1] ; Chen, CX (Chen, Chengxin) [1] ; Ding, J (Ding, Jie) [1] ; Yang, SS (Yang, Shanshan) [1] ; Zang, YN (Zang, Yani) [1] ; Ren, NQ (Ren, Nanqi) [1]

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Abstract

Fabrication of easily recyclable photocatalyst with excellent photocatalytic activity for degradation of organic pollutants in wastewater is highly desirable for practical application. In this study, a novel ternary magnetic photocatalyst BiVO4/Fe3O4/reduced graphene oxide (BiVO4/Fe3O4/rGO) was synthesized via a facile hydrothermal strategy. The BiVO4/Fe3O4 with 0.5 wt% of rGO (BiVO4/Fe3O4/0.5% rGO) exhibited superior activity, degrading greater than 99% Rhodamine B (RhB) after 120 min solar light radiation. The surface morphology and chemical composition of BiVO4/Fe3O4/rGO were studied by scanning electron microscopy, X-ray diffraction, X-ray photoelectron spectroscopy, UV visible diffuse reflectance spectroscopy, Fourier transform infrared spectroscopy, and Raman spectroscopy. The free radicals scavenging experiments demonstrated that hole (h(+)) and superoxide radical (O-2(center dot-)) were the dominant species for RhB degradation over BiVO4/Fe3O4/rGO under solar light. The reusability of this composite catalyst was also investigated after five successive runs under an external magnetic field. The BiVO4/Fe3O4/rGO composite was easily separated, and the recycled catalyst retained high photocatalytic activity. This study demonstrates that catalyst BiVO4/Fe3O4/rGO possessed high dye removal efficiency in water treatment with excellent recyclability from water after use. The current study provides a possibility for more practical and sustainable photocatalytic process.

Keywords
Author Keywords

Degradation

PhotocatalysisTernary magnetic photocatalystVisible-light-drivenFree radicals trappingReusabilityRecycling

Keywords Plus

GRAPHENE OXIDE COMPOSITESP-N HETEROJUNCTIONENHANCED PHOTOCATALYSISFACILE FABRICATIONMODIFIED BIVO4DOPED BIVO4PERFORMANCENANOPARTICLESREDUCTIONNANOSHEETS

Degradation

26- High efficiency heterogeneous Fenton-like catalyst biochar modified CuFeO2 for the degradation of tetracycline: Economical synthesis, catalytic performance and mechanism

By:
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Abstract

The heterogeneous Fenton-like catalysts biochar modified CuFeO2 (CuFeO2/BC) were fabricated by hydrothermal method without additional chemical reducing agent. The systematic characterization demonstrated that higher CuFeO2 particles dispersion and larger BET surface area of CuFeO2/BC catalyst contributed to higher catalytic activity towards the tetracycline (TC) degradation compared to pure-phase CuFeO2. The optimum conditions for TC removal were 598.63 mg L(-1)( )of CuFeO2/BC-1.0, 57.63 mM of H2O2 and pH = 6.27 according to the result of a response surface methodology based on the central composite design. The CuFeO2/BC-1.0 exhibited an excellent reusability and good stability by recycling degradation. The (OH)-O-center dot was evidenced to the main active radical by scavenging experiments and electron spin resonance. The XPS revealed that the high catalytic efficiency was attributed to the synergistic effect of Fe3+/Fe2+ and Cu2+/Cu+ redox cycles, and the degradation intermediates of TC and toxicity analysis were evaluated.

Keywords
Author Keywords
Heterogeneous FentonCuFeO2BiocharTetracyclineResponse surface methodology
Keywords Plus

Degradation

NANOTUBE ARRAY PHOTOELECTRODESRESPONSE-SURFACE METHODOLOGYPERSISTENT FREE-RADICALSZERO-VALENT IRONPHOTOCATALYTIC DEGRADATIONBISPHENOL-ADEGREES-CNANOPARTICLESOPTIMIZATIONADSORPTION

27- ZIF-8-modified MnFe2O4 with high crystallinity and superior photo-Fenton catalytic activity by Zn-O-Fe structure for TC degradation

By:
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Abstract

In this work, a novel Zeolite imidazole framework-8-modified MnFe2O4 magnetic catalyst was successfully synthesized by one step method. The 10% ZIF-8/MnFe2O4 exhibited superior photo-Fenton catalytic performance in TC degradation at a wider pH range (pH = 3-11). The excellent photo-Fenton catalytic effects were possibly attributed to the formation of Zn-O-Fe structure by ZIF-8-modified MnFe2O4, which could increase the absorption of visible light, promote the formation of crystal structure, and facilitate the generation and separation of photo-induced carrier. The existence of Zn-O-Fe structure formed by the occupation of Zn in ZIF-8 of tetrahedral sites in spinel structure was determined by X-ray diffraction (XRD). Meanwhile, the UV-vis diffuse reflectance spectrophotometer (UV-vis DRS), photocurrent and impedance characterization confirmed that the Zn-O-Fe structure could promote the separation of charge carriers. The possible two mechanisms were proposed and the Zn-O-Fe structure played different roles in different mechanism. In mechanism I, the Zn-O-Fe structure transfers of electrons from MnFe2O4 to ZIF-8. In mechanism II, the Zn-O-Fe structure can generate photo-electron and holes under visible light irradiation and transfer of electrons from ZIF-8 to MnFe2O4. This work is expected to provide valuable information for the design and synthesis of metal-organic framework modified spinel bimetallic oxides in heterogeneous photo-Fenton reactions.

Keywords

Degradation

Author Keywords
Photo-FentonMnFe2O4ZIF-8Zn-O-Fe structure
Keywords Plus
METHYLENE-BLUEBISPHENOL-AGOLD NANOPARTICLESMANGANESE FERRITEEFFICIENTPEROXYMONOSULFATEPHOTODEGRADATIONPERFORMANCEFRAMEWORKREMOVAL

Degradation

28- Fenton/Fenton-like processes with in-situ production of hydrogen peroxide/hydroxyl radical for degradation of emerging contaminants: Advances and prospects

By:
Liu, Y (Liu, Yong) [1] ; Zhao, Y (Zhao, Yang) [1] , [2] ; Wang, JL (Wang, Jianlong) [2] , [3]

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Abstract

Fenton processes based on the reaction between Fe2+ and H2O2 to produce hydroxyl radicals, have been widely studied and applied for the degradation of toxic organic contaminants in wastewater due to its high efficiency, mild condition and simple operation. However, H2O2 is usually added by bulk feeding, which suffers from the potential risks during the storage and transportation of H2O2 as well as its low utilization efficiency. Therefore, Fenton/Fenton-like processes with in-situ production of H2O2 have received increasing attention, in which H2O2 was in-situ produced through O-2 activation, then decomposed into hydroxyl radicals by Fenton catalysts. In this review, the in situ production of H2O2 for Fenton oxidation was introduced, the strategies for activation of O-2 to generate H2O2 were summarized, including chemical reduction, electro-catalysis and photo-catalysis, the influencing factors and the mechanisms of the in situ production and utilization of H2O2 in various Fenton/ Fenton-like processes were analyzed and discussed, and the applications of these processes for the degradation of toxic organic contaminants were summarized. This review will deepen the understanding of the tacit cooperation between the in situ production and utilization of H2O2 in Fenton process, and provide the further insight into this promising process for degradation of emerging contaminants in industrial wastewater.

Keywords
Author Keywords

Degradation

Fenton processAdvanced oxidation processesHydrogen peroxideWastewater treatmentDegradation

Keywords Plus

ELECTRO-FENTON PROCESSWASTE-WATER TREATMENTZERO-VALENT IRONADVANCED OXIDATION PROCESSESPERSONAL CARE PRODUCTSMICROBIAL FUEL-CELLSMODIFIED GRAPHITE FELTCORE-SHELL NANOWIRESPHOTO-FENTONHYDROXYL RADICALS

Degradation

29- Facile fabrication of TaON/Bi2MoO6 core-shell S-scheme heterojunction nanofibers for boosting visible-light catalytic levofloxacin degradation and Cr(VI) reduction

By:
Li, SJ (Li, Shijie) [1] , [2] ; Wang, CC (Wang, Chunchun) [1] , [2] ; Cai, MJ (Cai, Mingjie) [1] , [2] ; Yang, F (Yang, Fang) [3] ; Liu, YP (Liu, Yanping) [1] , [2] ; Chen, JL (Chen, Jialin) [1] , [2] ; Zhang, P (Zhang, Peng) [4] ; Li, X (Li, Xin) [5] ; Chen, XB (Chen, Xiaobo) [6]
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Abstract

Developing excellent photocatalysts for antibiotics degradation and Cr(VI) reduction is of vital significance but still a big challenge. Herein, novel S-scheme heterojunction of TaON/Bi2MoO6 with a core-shell structure is constructed via an electrospinning-calcination-nitridation approach, where 2D Bi2MoO6 nanosheets are uniformly and firmly anchored on the surface of 1D TaON nanofibers. The optimal TaON/Bi2MoO6 with the TaON/ Bi2MoO6 molar ratio of 1:1 manifests the highest catalytic activity towards levofloxacin (LEV) antibiotic degradation and Cr(VI) reduction under visible light. The exceptional photocatalytic performance is probably due to the synergistic effect of the favorable core-shell fiber-shaped structure and S-scheme hetero-structure, which enables the strong interfacial interaction between the constituents for effectively improving the visiblelight absorption, boosting the separation and utilization efficiency of electron-hole pairs, and retaining the charge carriers with stronger redox capabilities. Of note, TaON/Bi2MoO6 possesses excellent stability and reusability. Photo-generated h+, center dot OH, and center dot O2- are the main reactive species accounting for LEV degradation, the

detailed LEV degradation pathways are elucidated by detecting the intermediates using HPLC-MS and the toxicity of the intermediates are assessed by quantitative structure-activity relationship (QSAR) method. In addition, center dot O2- and e- are primarily responsible for Cr(VI) reduction. Further, a possible photocatalytic reaction mechanism for removal of LEV and Cr(VI) is proposed. This study provides some insights in fabricating highperformance S-scheme heterojunction photocatalysts for the efficient water purification.

Keywords
Author Keywords
TaON nanofibersBi2MoO6TaON S-schemeVisible-light photocatalysisAntibiotic degradationCr(VI) reductionDegradation pathway
Keywords Plus
PHOTOCATALYTIC ACTIVITYRESISTANCE GENESTAONHETEROSTRUCTURECONSTRUCTIONMICROSPHERESPERFORMANCENANOSHEETSOXIDATIONEVOLUTION

Degradation

30- Does interaction between technological innovation and natural resource rent impact environmental degradation in newly industrialized countries? New evidence from method of moments quantile regression

By:
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Abstract

As a contribution to the technological innovation-natural resource rent-environment literature, this study examines the technological innovation and natural resource rent in an environmental Kuznets curve (EKC) multivariate framework. We employed reliable, robust, and efficient novel panel estimations methods on a sample of 10 newly industrialized countries (NICs) over the periods 1990 and 2018. To achieve our study objective, we employ the method of moments quantile regression (MMQR) approach to analyze the effects of the exogenous variables over the range of diverse quantiles of carbon emissions. Results generated from the MMQR mimic that of the three heterogeneous linear panel estimations (fully modified ordinary least square, the dynamic ordinary least square, and the fixed effects ordinary least square) in terms of the sign and magnitude. The result affirms the existence of the environmental Kuznets curve (EKC) hypothesis in NICs across all quantiles (0.1-0.95). In addition, technological innovation and renewable energy consumption improve environmental quality in NICs across quantiles (0.1-0.95), while the joint impact of technological and natural resource rent mitigates environmental degradation from

lower to higher quantiles (0.1-0.90). Moreover, technological innovation is found to exert an indirect favorable impact on the environment through the pathway of natural resources. Thus, technological innovation can be anticipated to enhance sustainable natural resources exploration in the NICs. In line with these crucial outcomes, this research proposes that the NICs should promote technological innovation, promote sustainable natural resource exploitation, and expedite economic expansion rates via the sustainable transformation of their production and consumption processes.

Keywords
Author Keywords
Technological innovationNatural resource rentRenewable energy consumptionEconomic growthMethod of moments quantile regressionNICs
Keywords Plus
ENERGY-CONSUMPTIONCO2 EMISSIONSPANEL

Degradation

31- Degradation of acetaminophen by activated peroxymonosulfate using Co (OH)(2) hollow microsphere supported titanate nanotubes: Insights into sulfate radical production pathway through CoOH+ activation

By:
Chen, L (Chen, Long) [1] ; Ji, HD (Ji, Haodong) [1] , [2] ; Qi, JJ (Qi, Juanjuan) [1] , [2] ; Huang, TB (Huang, Taobo) [1] ; Wang, CC (Wang, Chong-Chen) [3] ; Liu, W (Liu, Wen) [1] , [2]
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Abstract

Pharmaceuticals and personal care products (PPCPs) are of great concern due to their increasing health effects, so advanced treatment technologies for PPCPs removal are urgently needed. In this study, titanate nanotubes decorated Co(OH)(2) hollow microsphere (CoM/TNTs) composites were synthesized by a two-step solvothermal method, and used to activate peroxymonosulfate (PMS) through heterogenous catalysis for acetaminophen (ACE) degradation in water. The optimum material (CoM/TNTs0.5) activated PMS system exhibited high ACE removal efficiency and quick kinetic, as 93.0% ACE was degraded even within 10 min. The two components in CoM/TNTs showed a synergetic effect on PMS activation for radicals production: Co(OH)(+) from CoM was the primary active species to active PMS, while TNTs could offer abundant -OH groups for Co(OH)(+) formation. Density functional theory (DFT) calculation further interpreted the mechanism of Co(OH)(+) for PMS activation by means of reaction potential energy surface (PES) analysis. Both the scavenger quenching tests and electron paramagnetic resonance analysis revealed that the sulfate radical (SO4 center dot-) played a dominant role in ACE de gradation. Moreover, DFT calculation also suggested that the ACE atoms with high Fukui index (f(-)) represented the active sites for electrophilic attack by SO4 center dot-. The toxicity analysis based on quantitative structure-activity relationship (QSAR) verified the reduced toxicity of transformation products. Furthermore, CoM/TNTs

also had good reusability and stability over five cycles. This work provides deep insights into the reaction mechanisms of radical production and organics attack in cobalt-based PMS activation system.

Keywords
Author Keywords
PharmaceuticalsSulfate radicalTitanateHeterogenous catalysisDFT calculation
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ADVANCED OXIDATION PROCESSESWASTE-WATER TREATMENTEFFICIENT DEGRADATIONPHOTOCATALYTIC DEGRADATIONHETEROGENEOUS ACTIVATIONORGANIC CONTAMINANTSHIGHLY EFFICIENTADSORPTIONNANOPARTICLESOXIDE

Degradation

32- A review of the innovations in metal- and carbon-based catalysts explored for heterogeneous peroxymonosulfate (PMS) activation, with focus on radical vs . non-radical degradation pathways of organic contaminants

By:
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Abstract

The heterogeneous, sulfate radical-based AOPs (SR-AOPs) have emerged over the last decade as a highly potent technology for the removal of various organic contaminants from water. This review aims to summarize the rapid development of the various heterogeneous catalysts developed for peroxymonosulfate (PMS) activation, destined for the degradation of organic contaminants. We cover catalysts such as metal and bi-metallic oxides, supported noble/non-noble metal catalysts, carbonaceous-based materials, layered double hydroxides, metal organic frameworks, zeolite and perovskite-based catalysts, used as effective activators for the activation of PMS. The radical and non-radical pathways, as well as the role of each radical in the reaction mechanism were discussed in detail. In addition, the physicochemical properties of the catalyst influencing the PMS activation mechanisms were summarized. Finally, a critical comparison of the main categories of heterogeneous catalysts is presented, while the opportunities and shortcomings of their conception and application are also discussed.

Keywords
Author Keywords

Degradation

Peroxymonosulfate activationHeterogeneous catalystsRadical and non-radical pathwaysSinglet oxygenElectron transfer mechanism

Degradation

33-One-pot thermal polymerization route to prepare N-deficient modified g-C3N4 for the degradation of tetracycline by the synergistic effect of photocatalysis and persulfate-based advanced oxidation process

By:
Sun, HR (Sun, Haoran) [1] ; Guo, F (Guo, Feng) [1] ; Pan, JJ (Pan, Jingjing) [1] ; Huang, W (Huang, Wei) [3] ; Wang, K (Wang, Kai) [1] ; Shi, WL (Shi, Weilong) [2]
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Abstract

N-deficient g-C3N4 (CNx) photocatalyst was synthesized via a simple one-step thermal polymerization of urea and oxamide for the degradation of tetracycline (TC) under visible-light irradiation in the presence of persulfate (PS) activation. The microstructure and morphology of CNx were investigated by a host of characteristic technologies. The experimental result revealed that CNx/PS system displays a high efficiency in the photocatalytic process of TC degradation. The effects of different environmental factors (catalyst dose, PS dose, initial TC concentration and initial pH) on the degradation of the system were investigated. The possible intermediates products were discussed based on the liquid chromatography-mass spectrometry (LC-MS) analysis. Moreover, the toxicity of the TC solution over CNx/PS synergistic photocatalytic system was studied by the culture of bean sprouts, demonstrated that the aquatic toxicity of the TC after degradation of the system was effectively reduced.

Keywords
Author Keywords
N-deficient g-C3N4Persulfate activationVisible-lightPhotocatalysisAdvanced oxidation processTetracycline
Keywords Plus

Degradation

GRAPHITIC CARBON NITRIDENITROGEN DEFECTSPEROXYMONOSULFATE PMSHYDROGEN EVOLUTIONPOROUS G-C3N4HETEROJUNCTIONWATERACTIVATIONKINETICSDOTS